

Official

2 of 6

several collectors have been developed and used by the military and first responders. However, recent incidents of bio-terrorism have revealed serious shortcomings of these collectors. When these were used in conjunction with immunoassay-based test strips, the resulting effective detection limit for anthrax bacilli was far above the known dangerous or lethal concentrations, so that inhalation of low but lethal doses of anthrax or other biological warfare [BW] aerosol agents could have been easily overlooked. Although several existing wetted wall cyclone aerosol collectors can remove a substantial fraction of particulates from a large volume of air (several cubic meters) and transfer them into a small liquid volume (a few milliliters) for analysis, their power requirements are high (400-500 watts) driven watts) – driven by the need to collect particles as small as 1 micron. Cyclones and most inertial separation devices are intrinsically very inefficient at capturing small particles.”

[0007] Should read:

“Somewhat of an exception may be the PHTLAAS [Portable HTLAAS] of U.S. Patent No. 6,087,183, a variant of which was found to yield a collection efficiency of  $66\pm3\%$  for 1-micron particles and  $84\pm4\%$  for 4-micron particles at an air flow rate of 317 liters/minute, as reported by Kesavan, J.; Carlile, D.; Doherty, R. W.; Sutton, T.; and Hottell, A.; “CHARACTERISTICS AND SAMPLING EFFICIENCY OF PHTLAAS™ AIR SAMPLER,” ECBC-TR-267, 2002. When a similar sampler, hereafter referred to as “recent PHTLAAS” [Fig. 1], was operated at full power with a 12-volt battery, the measured power consumption was only 42 watts [3.5 amps at 12 volts]. The comparatively low power consumption of only 42 watts by the recent PHTLAAS is attributed to its patented unique flow pattern in which the direction of the air stream is partly reversed as it enters through the air intake, as disclosed in U. S. Patent Number 6,087,183. Although 6,087,183.

Official

<sup>3</sup> of 6

Although this recent PHTLAAS seems to compare favorably with other inertial-separation-type collectors, it still cannot match the much higher efficiencies that are obtainable with electrostatic precipitation [EP] technology for removing small particles from a gas [see, e.g., Altman, R.; Buckley, W.; and Ray, I; "WET ELECTROSTATIC PRECIPITATION DEMONSTRATING PROMISE FOR FINE PARTICULATE CONTROL," Power Engineering, January-February, 2001, or Parker, K. R., editor, "Applied Electrostatic Precipitation," Chapman & Hall, London, 1997]."

[0028] Should read:

"Of the components shown in Fig. 2, the topmost air exhaust 1 and the lowermost liquid collection and removal system 3 can be substantially the same as or similar to the same components 22-27 and 12-14, respectively, in the recent PHTLAAS of Fig. 1. The collector electrode 5 can be similar to the sampling tube 21 of Fig. 1 but with its inner surface electrically conducting. The main altogether new components are the central wire-or rod-shaped discharge electrode 7, kept at a high negative or positive potential [possibly of as much as 10 KV or higher], and a horizontal tubular EP air intake 9, through which air can enter unimpeded at a high flow rate with a minimal pressure drop."

[0031] Should read:

"The performance of the WEP is strongly dependent on the ratio of liquid and gas flows and on the size of the droplets. A preferred wetting approach is to generate a water mist ultrasonically near the sampler inlet and let the inrushing air carry the mist with it. After operating a Reli On® Model H-0565-0 30-watt 2-gallons/day [5 ml/minute] ultrasonic humidifier near the 1.5" intake opening and adjusting the flow rate to about 600 l/min, we achieved full wetting of the 2" ID tube starting from the lower portion and extending through its 18" length within a few minutes

Official

<sup>4</sup> of 6

even without applying a high voltage between the collector and discharge electrodes. With EP, the droplets get charged and carried rapidly towards the wall, which speeds up the wetting process."

[0039] Should read:

"**Modification 1:** To provide an EP air intake, a sizable radial hole, preferably ≥1", is made in the lower tubular container 13 of the PHTLAAS of Fig. 1 and a straight tubular inlet 9 of the same outer diameter is threaded or otherwise fitted into it. Intake 9 replaces and differs in two major ways from the slanted intake 15 of Fig. 1. Intake 9 is not only horizontal as in Fig. 2, but it also directs the air into chamber 17 first radially towards the axis and then linearly upward, so as to minimize resistance to airflow. Therefore, the power needed to draw air through intake 9 is far lower than what would be required to achieve a comparable flow rate through the replaced inlet 15. The power, i.e., voltage and current, fed to the air blower 22 of Fig. 1 can then be adjusted to higher flow rates through intake 9."

[0044] Should read:

"*EXAMPLE 1:*

*For collection efficiency measurements, we use suspended 1-micron fluorescent beads obtained from Duke Scientific Corporation, Palo Alto, CA 94303. The fluorescent beads permit direct measurements with the aid of a fluorometer of the amounts of particles captured in the collection medium. The concentrations of particles in the sampled air is are measured with the aid of a reference filter and their variations within our 3,000-liter test chamber are monitored with an APS [Aerodynamic Particle Sizer] instrument.*

*The described system was assembled, tested, and fine-tuned as follows:*"